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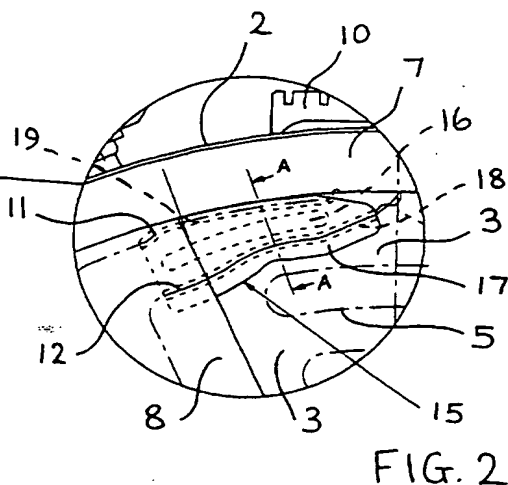
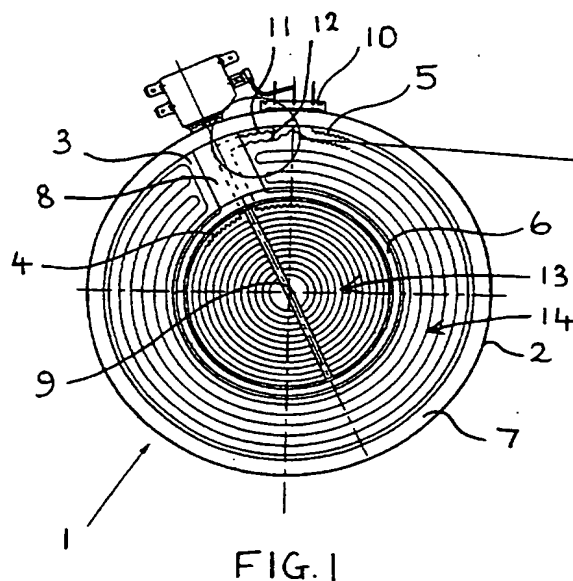
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**US 4700051 A**

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INT CL<sup>6</sup> **F24C 15/10, H05B 3/06 3/26 3/74**  
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(54) Abstract Title  
**Radiant electric heater with visible radiation shielding**

(57) A radiant electric heater (1) comprises at least one elongate heating element (4) supported on a base (3) of insulation material and wherein at least one elongate electrically insulating refractory component (15) is provided comprising a mounting portion (16) received in the base (3) of insulation material and a cover portion (17) adapted to overlie at least one portion (11;12) of the at least one elongate heating element and such that, when the heater is energised, visible radiation from the at least one portion (11;12) of the at least one elongate heating element (4) is substantially obscured.



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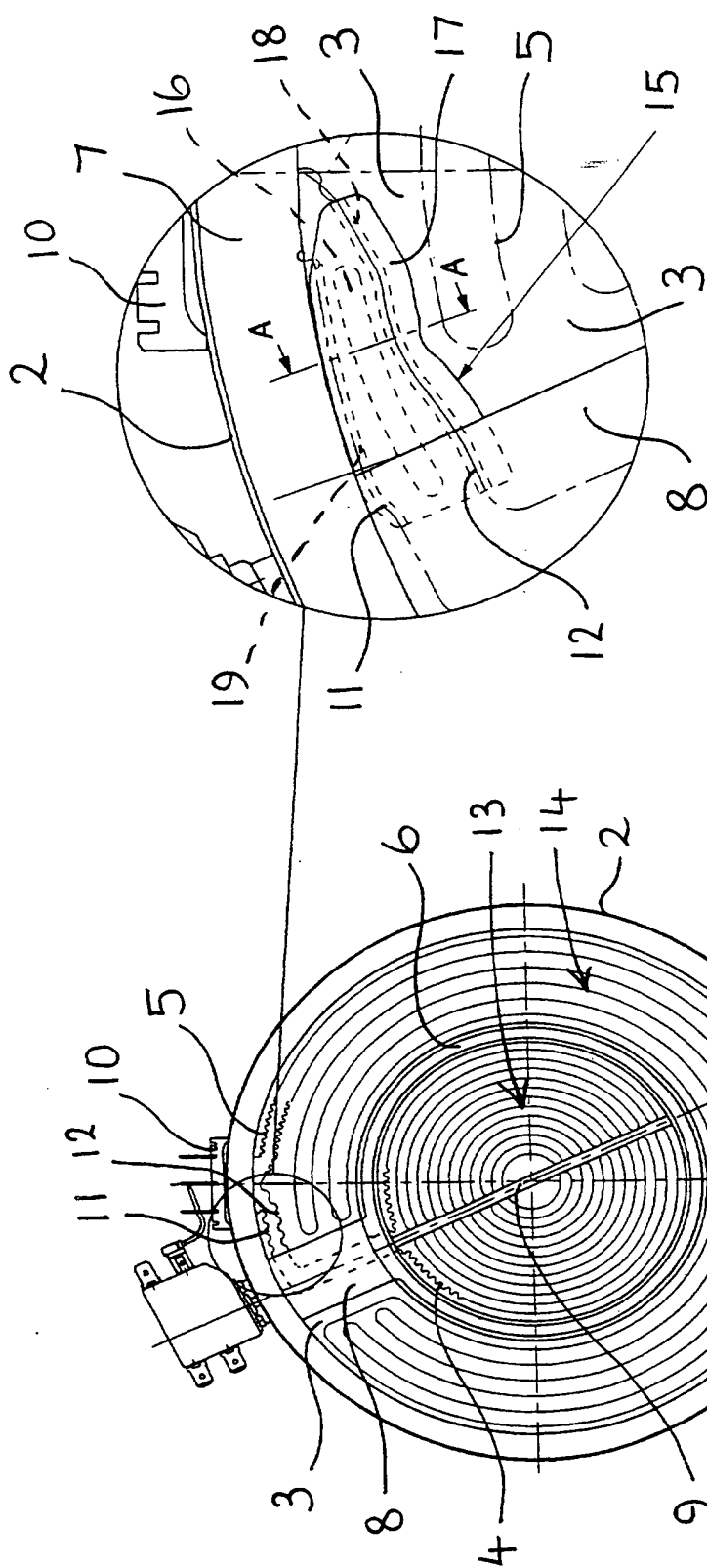


FIG. 1

FIG. 2

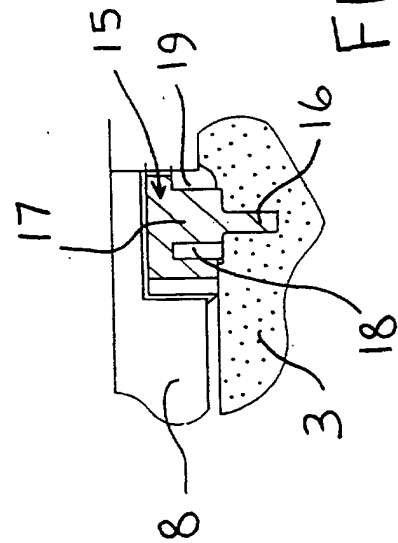


FIG. 3

Radiant Electric Heater

This invention relates to radiant electric heaters, particularly, but not exclusively, for use in cooking appliances.

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The invention finds particular application to radiant electric heaters for use in glass-ceramic top cooking appliances and particularly, but not exclusively, to multiple zone heaters for use in such appliances.

10 Radiant electric heaters are well known in which one or more heating elements such as of wire or ribbon form are supported on a base of thermal and electrical insulation material, such as microporous thermal insulation material. The insulation material may comprise or be included in a dish-like support and the one or more heating elements are generally arranged to be electrically connected to one or more terminal blocks provided on an outer edge of the support.

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Multiple zone heaters are well known in which two or more heating elements are arranged in adjacent regions of a heater to provide two or more separate heating zones which may be separated by one or more walls of insulation material. Such two or more separate heating zones may be concentrically arranged or laterally arranged in elongate forms of heater, such as

20 multiple zone heaters of oval or elongate rectangular form.

25

With multiple zone heaters there is often a requirement for terminal portions of heating element in one zone to pass through another zone in order to be connected to a terminal block at the edge of the heater. A heating element in one zone may be arranged to be energised when a heating element in the other zone through which its terminal portions pass is not energised.

This means that these terminal portions will exhibit visible radiance which is aesthetically undesirable, particularly when the heater is operated beneath a glass-ceramic cook top.

Problems can arise if it is attempted to bury the terminal portions in insulation material such as is used for the base or peripheral wall of the heater. Overheating of the buried portions can occur, particularly when a heating element of ribbon form is provided, resulting in failure of the element. The terminal portions could also be replaced by solid conducting links, but these then require to be welded, or otherwise electrically connected, to the heating element and this can lead to unreliability.

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In addition to the aforementioned problem with multiple zone heaters, there may also be a requirement to visibly obscure terminal regions of heating element in single zone heaters, or one or more selected portions of heating element at any specified location in a heater.

15 It is an object of the present invention to overcome this problem.

The present invention provides a radiant electric heater comprising at least one elongate heating element supported on a base of insulation material and wherein at least one elongate electrically insulating refractory component is provided comprising a mounting portion received in the base of insulation material and a cover portion adapted to overlie at least one portion of the at least one elongate heating element and such that, when the heater is energised, visible radiation from the at least one portion of the at least one elongate heating element is substantially obscured.

The at least one elongate electrically insulating refractory component may also serve to dissipate heat from the at least one portion of the at least one elongate heating element.

5 The mounting portion may be substantially in the form of one or more legs or fins, secured to or integral with the cover portion.

The cover portion may be in the form of a block having at least one tunnel, channel or rebate provided therein accommodating the at least one portion of the at least one elongate heating element.

10

The mounting portion may be received in the base of insulation material between two laterally disposed portions of the at least one elongate heating element, with the cover portion overlying the two laterally disposed portions.

15 The at least one elongate electrically insulating refractory component may comprise a ceramic material, such as steatite or alumina.

Alternatively the at least one elongate electrically insulating refractory component may comprise mica or vermiculite, particularly in block form.

20

The base of insulation material may comprise microporous thermal and electrical insulation material and may be provided compacted into a dish-like support, such as of metal.

The at least one elongate electrically insulating refractory component may have the mounting portion thereof received in the base by pressing into the microporous insulation material during or subsequent to compaction of the insulation material.

- 5 The at least one elongate heating element may be of wire or ribbon form.

In a particular embodiment, the at least one elongate heating element comprises a corrugated ribbon supported edgewise on the base of insulation material and secured by partial embedment in the base. In this embodiment the at least one elongate electrically insulating refractory  
10 component may have the mounting portion thereof secured by partial embedment in the base simultaneous with the securement of the at least one elongate heating element.

The at least one portion of the at least one elongate heating element may comprise at least one end portion of the at least one elongate heating element. Such at least one end portion may be  
15 part of an elongate heating element located in a first zone of the heater and crosses at least part of a second zone of the heater in which is located at least one further heating element, the elongate heating element in the first zone being energisable independently of the at least one further heating element in the second zone.

- 20 The first and second zones of the heater may be separated by a wall of insulating material.

The invention is now described by way of example with reference to the accompanying drawings in which:

- 25 Figure 1 is a plan view of a radiant electric heater to be completed according to the invention;

Figure 2 is an enlarged detail of part of the heater of Figure 1 completed according to the invention; and

5 Figure 3 is a section along line A-A of Figure 2.

Referring to the drawings, a radiant electric heater 1 is provided for use beneath a glass-ceramic top (not shown) in a cooking appliance. The heater 1 comprises a metal dish-like support 2 having therein a base 3 of compacted microporous thermal and electrical insulation  
10 material.

Two elongate heating elements 4, 5 are provided in the heater. Heating element 4 is supported on the base 3 at a central region of the heater and heating element 5 surrounds the heating element 4 and is likewise supported on the base 3. Heating elements 4 and 5 suitably comprise  
15 corrugated metal ribbons of well known form supported edgewise on the base 3 and secured by partial embedment in the base 3.

The heating elements 4 and 5 are separated by a circular wall 6 of thermal insulation material and a further circular wall 7 of thermal insulation material surrounds the heater at the  
20 periphery thereof.

A gap is provided between turns of the outer heating element 5 and a block 8 of thermal insulation material is located in this region between the inner wall 6 and the outer wall 7. The block 8 is hollowed out inside to form a tunnel and a well known form of temperature limiter 9  
25 passes through the tunnel and crosses the central heating element 4. The limiter is therefore

responsive only to the central heating element 4, being thermally isolated from the outer heating element 5 by means of the block 8.

A terminal block 10 is provided at the edge of the heater and the ends of the heating elements 4 and 5 are connected thereto. End portions 11, 12 of the central heating element 4 pass through the tunnel 8 and enter the area occupied by the outer heating element 5 before being connected to the terminal block 10.

The heating elements 4, 5 are arranged such that two heating zones 13, 14 are provided. The central heating element 4 can be energised alone to provide heated zone 13 to heat a small cooking utensil located on an overlying glass-ceramic cook top (not shown). Both heating elements 4 and 5 can also be energised together to provide heated zones 13 and 14, to heat a larger cooking utensil covering both zones on the overlying cook top.

When the central heating element 4 is energised alone, the resulting radiance therefrom is visible through the glass-ceramic cook top and radiance from the end portions 11, 12 is also visible in the area occupied by the unenergised outer heating element 5. This is aesthetically unsatisfactory.

In order to solve this problem, an elongate electrically insulating refractory component 15 is provided as shown in Figures 2 and 3. Component 15 is made from a material possessing good thermal conductivity. A suitable material is a ceramic, such as steatite or alumina. Alternative materials are mica or vermiculite, particularly in block form. The component 15 comprises a mounting portion 16 in the form of a protruding leg or fin and a cover portion 17 integral therewith. The mounting portion 16 is received in the base 3 between the two end portions 11,



12 of the heating element 4 and retained in the base by friction. The cover portion 17 is of block-like form and is provided with a channel or tunnel 18 therein through which one end portion 12 of the heating element passes and a rebate 19 into which the other end portion 11 of the heating element is located. One end of the component 15 may protrude into the tunnel  
5 provided in the insulating block 8.

When the heating element 4 is energised alone, the component 15 obscures otherwise visible radiation from the end portions 11, 12 of the heating element 4 from view through the glass-ceramic cook top. As a result of the comparatively good thermal conductivity of material of  
10 the component 15, heat from the end portions 11, 12 of the heating element 4 is able to be dissipated into the surroundings, thereby preventing unacceptably high temperatures from occurring in the end portions 11, 12 of the heating element 4 where overlain by the component 15.

15 As referred to above, the corrugated ribbon heating elements 4, 5 are secured to the base 3 of microporous insulation material by partial embedment therein. This is achieved by pressing the ribbon elements edgewise into the insulation material 3. A two stage process may be carried out in which, in a first stage microporous insulation material is compacted to an initial density in the support 2. In a second stage, the ribbon elements 4, 5 are pressed into the  
20 surface of the insulation material 3 and the material 3 is compacted to its final density.

The elongate electrically insulating refractory component 15 can be likewise secured to the base 3 with its mounting portion 16 pressed into the surface of the base 3. The component 15 can be located and secured simultaneously with the ribbon heating elements 4, 5 using the same  
25 two-stage process described above if desired.

Although the component 15 has been described herein with application to terminal regions of a ribbon form heating element, it will be clear to the skilled person that it would be applicable to other forms of heating element, such as coiled wire elements, and also applicable at other regions of a heating element where it is desired to obscure visible radiation from the heating element without resulting in excessive rise in temperature of the heating element where it is applied.

Claims

1. A radiant electric heater comprising at least one elongate heating element supported on a base of insulation material and wherein at least one elongate electrically insulating refractory component is provided comprising a mounting portion received in the base of insulation material and a cover portion adapted to overlie at least one portion of the at least one elongate heating element and such that, when the heater is energised, visible radiation from the at least one portion of the at least one elongate heating element is substantially obscured.
2. A heater according to claim 1, in which the at least one elongate electrically insulating refractory component also serves to dissipate heat from the at least one portion of the at least one elongate heating element.
3. A heater according to claim 1 or 2, in which the mounting portion is substantially in the form of one or more legs or fins, secured to or integral with the cover portion.
4. A heater according to claim 1, 2 or 3, in which the cover portion is in the form of a block having at least one tunnel, channel or rebate provided therein accommodating the at least one portion of the at least one elongate heating element.
5. A heater according to any one of the preceding claims, in which the mounting portion is received in the base of insulation material between two laterally disposed portions of the at least one elongate heating element, with the cover portion overlying the two laterally disposed portions.

6. A heater according to any one of the preceding claims, in which the at least one elongate electrically insulating refractory component comprises a ceramic material.
- 5 7. A heater according to claim 6, in which the ceramic material comprises steatite or alumina.
8. A heater according to any one of claims 1 to 5, in which the at least one elongate electrically insulating refractory material comprises mica or vermiculite.
- 10 9. A heater according to claim 8, in which the mica or vermiculite is provided in block form.
10. A heater according to any one of the preceding claims, in which the base of insulation material comprises microporous thermal and electrical insulation material.
- 15 11. A heater according to claim 10, in which the microporous insulation material is provided compacted into a dish-like support.
12. A heater according to claim 11, in which the at least one elongate electrically insulating refractory component has the mounting portion thereof received in the base by pressing  
20 into the microporous insulation material during or subsequent to compaction of the insulation material.
13. A heater according to any one of the preceding claims, in which the at least one elongate heating element is of wire or ribbon form.

14. A heater according to claim 13, in which the at least one elongate heating element comprises a corrugated ribbon supported edgewise on the base of insulation material and secured by partial embedment in the base.

15. A heater according to claim 14, in which the at least one elongate electrically insulating refractory component has the mounting portion thereof secured by partial embedment in the base simultaneous with the securement of the at least one elongate heating element.

16. A heater according to any one of the preceding claims, in which the at least one portion of the at least one elongate heating element comprises at least one end portion of the at least one elongate heating element.

17. A heater according to claim 16, in which the at least one end portion is part of an elongate heating element located in a first zone of the heater and crosses at least part of a second zone of the heater in which is located at least one further heating element, the elongate heating element in the first zone being energisable independently of the at least one further heating element in the second zone.

18. A heater according to claim 17, in which the first and second zones of the heater are separated by a wall of insulating material.

19. A radiant electric heater constructed and arranged substantially as hereinbefore described with reference to the accompanying drawings.



# The Patent Office

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Application No: GB 9708849.6  
Claims searched: 1-19

Examiner: John Cockitt  
Date of search: 25 July 1997

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): H5H [HAK, HAM]; F4W [44D]

Int Cl (Ed.6): H05B [03/74, 03/06, 03/26]; F24C [15/10]

Other: ONLINE: WPI, CLAIMS, JAPIO

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	US4700051A E.G.O - see mask 114 fig23	1 at least

X Document indicating lack of novelty or inventive step  
Y Document indicating lack of inventive step if combined with one or more other documents of same category.

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